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SOME MYRMECOPHILOUS INSECTS FROM MEXICO.[1]

By W. M. Mann.

The following notes are based on a small collection made during the months of May, June and July, 1913, in the State of Hildalgo, Mexico. Most of this time was spent at the Guerrero Mill, located below Real del Monte, and at the Hacienda de Velasco, where I was the guest of Mr. and Mrs. C. W. Van Law. They, together with the other Americans and English in charge of the mines and mills, showed me every hospitality and it is largely due to them that I was able to reside and collect in this interesting locality. I am much indebted to Miss Helen L. Locke, Mr. and Mrs. J. H. Skews and Messrs. Broiderick, Benton, Funston and Calland, not only for assistance of various kinds, but for many desirable specimens which they collected. The material collected has been placed in the collections of the Museum of Comparative Zoölogy at Cambridge and of Mr. B. Preston Clark of Boston, through the kindness of whom the excursion was possible.

Although this region is easily accessible, and unusually interesting and rich in insect life because of its ecologically varied nature, it has been largely neglected by collectors. Only a few things have been collected at Pachuca and at Guerrero Mill. Prof. W. M. Wheeler, in looking over the literature on Mexican ants, failed to find Hidalgo cited as the locality for a single species, and I have found no records of other insects from that state.

Among the thirty-nine species and varieties of ants collected (an account of these has been published by Wheeler in the *Journal of the New York Entomological Society*, Vol. XXII, 1914, pp. 37–61) nine were found to harbor guests or parasites. Three of these belong to the genus Formica, one each to Camponotus, Prenolepis,

[1] Contribution from the Entomological Laboratory of the Bussey Institution of Harvard University, No. 84.

Liometopum and Tapinoma, and two to Pheidole, all of which genera are commonly the hosts of inquilines, Prenolepis less frequently than the others. The inquilines found are mostly undescribed species of genera known to be of myrmecophilous habits, but a new Diaprid, *Hemilexis jessei*, and a new genus of Bethylidæ, *Bruesiella formicaria*, both of which are probably parasitic on the host ant, are described. There is also an interesting new genus of cockroach, *Myrmecoblatta rehni*, which inhabits nests of various species of ants, where it no doubt officiates as scavenger. The occurrence of the weevil *Liometophilus manni* Fall at Pachuca, with the same species of host with which it has been found in Arizona shows that it is definitely associated with this ant.

I have included in this paper a few remarks on the synonomy of some species from north of the Mexican boundary, and erected a new subgenus to contain certain of our species of Cremastocheilus.

ORTHOPTERA.

Family Blattidæ.

Subfamily BLATTINÆ.

Myrmecoblatta gen. nov.

Female: Body elongate oval, not greatly flattened, the abdomen about as broad as the thorax. Head almost concealed by the pronotum, only a narrow strip of the vertex showing. Head small, triangular, the vertex somewhat swollen. Eyes well developed, elongate, emarginate on inner border. Antennæ long and slender, the first joint thickened, the second small, the third longer than the second and twice the length of the fourth. Thorax longer than broad, convex above, tegmina and wings absent. Abdomen convex above, beneath gradually elevated to the middle, which is therefore broadly carinate. Supra-anal plate semi-orbicular, evenly rounded in outline. Cerci large, with eight distinct joints. Sub-genital plate apparently provided with valves. Last ventral segment completely divided by a V-shaped slit. Legs short and robust, with abundant fine, short hairs. Femora weakly armed beneath, and with a strong spine at apex; tibiæ spined at apex and on outer margin.

Male: Form broad. Pronotum entirely concealing the head. Tegmina more than half as broad as long; short, not reaching apex of abdomen, with poorly developed veins. Wings short and broad, less than half the length of tegmina, with poorly developed veins. Supra-anal plate more than twice as long as broad, the sides concave in outline, posterior border notched at middle, rounded on either side. Sub-genital plate broader than long, straight at sides, rounded behind, slightly concave at middle, bearing two equal stylets.

Type: Myrmecoblatta rehni sp. nov.

Myrmecoblatta rehni sp. nov.

Female: (Fig. 1). Length 5 mm. Width 3 mm. Color reddish-brown, the legs lighter, above regularly punctate and finely setose. Thorax longer than broad. Pronotum broader than long, with concave posterior border and extended, narrowly rounded angles. Meso-and epinota subequal, with nearly straight sides and concave posterior border. Abdominal segments 1–7 subequal, with straight posterior borders, the eighth considerably narrower than the seventh, rounded behind. Cerci 8-jointed, a third as broad as long, acuminate for apical half their length; nearly as long as the sub-genital plate. Head about as broad as long, the front with an indistinct Y-shaped suture. Labium obtusely pointed, concealing the mandibles. Eyes occupying the sides of the head, faintly emarginate on the inner border. Antennæ slender, shorter than the body, about 37-jointed; the third joint twice as long as the fourth, joints 4–13 transverse, the rest distinctly longer than broad, and sub equal; all the joints finely setose. Legs short, rather flat, the femora armed at apex with a slender curved spine; tibiæ bearing on the outer border three slender subequal spines, at the apex two long and two shorter spines.

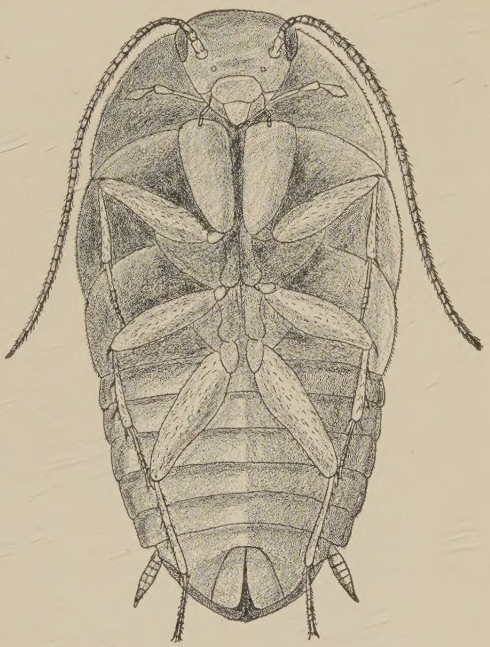

Fig. 1. *Myrmecoblatta rehni* gen. & sp. nov. Ventral surface of female.

Male: (Fig. 2). Length 4.5 mm. Width 2 mm. Color and setosity similar to that of female. Pronotum proportionally slightly broader than in the female, the angles broadly rounded, posterior border concave. Tegmina extending a little more than two-thirds the length of abdomen, broadly oval in outline, the apex narrowly rounded; venation not very distinct. Wings less than half the length of tegmina. Cerci

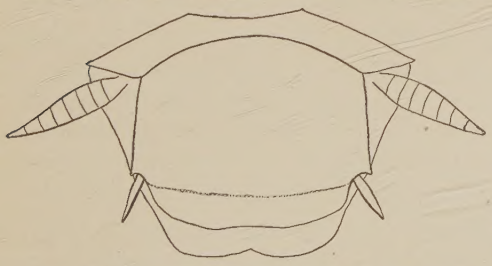

Fig. 2. *Myrmecoblatta rehni* gen. & sp. nov. Ventral surface of last gastric segments of male.

more slender than in the female, longer than the supra-anal plate at middle. Legs and antennæ longer than in the female, the latter as long as the body.

Nymph: Similar to female, lighter in color. The suture on the front of head is more distinct than in the adult.

Described from one male and numerous females and nymphs taken at Guerrero Mill in nests of *Formica subcyanea* Wheeler, *F. rufibarbis* Fab. var. *gnava* Buckley, and *Camponotus maculatus* Fab. subsp. *picipes* Olivier. Some of the females had oöthecæ attached. They were abundant, several occurring in almost every nest, where they are no doubt very efficient scavengers. The genus has no systematic affinities with *Attaphila*, the only other known Blattid of Myrmecophilous habits, but is more closely related to Blatta, to which it runs in Caudell's key to the genera of this family (*Proc. U. S. Nat. Mus.* Vol. 44, 1913, p. 601–602).

COLEOPTERA.

Family STAPHYLINIDÆ.

Pseudolomechusa subgen. nov.

Type: *Xenodusa sharpi* Wasmann.

This beetle was described by Wasmann from a series which were taken at Cuernavaca, in company with *Camponotus auricomus* Roger. In one canyon near the Guerrero Mill I found a number of adults, some of them in copula, with colonies of *Camponotus maculatus* var. *picipes*, Olivier which was here very abundant. In the immediate vicinity were many nests of *Formica microgyna rasilis* var. *nahua* Wheeler and several of *T. rufibarbis* var. *gnava*. Buckley. With the former ant three adults of *sharpi* were taken and with *gnava* several more, and three larvæ, the latter close to the ant brood. As most of the beetles were found with *C. picipes* (nineteen were taken from one nest) it appears that this is the secondary or winter host and *F. gnava* the primary or definitive. This heterocious habit is common to all of our species of *Xenodusa* as far as known. The adult *sharpi* is very different from the other American species on account of its greatly thickened pronotal margins and shorter antennal joints. Seen in profile the anterior border is drawn out beneath into a distinct angle similar to the structure in the species of the European genus Lomechusa.

The larva is very different from that of *X. cava*, the only one known in that stage, which has been described and figured by Wheeler (*Jour. N. Y. Ent. Soc.*, Vol. XIX, 1911, p. 165–166) and closely resembles that of Lomechusa. Those which I found are 5.5 mm. in length, yellowish-white in color, with short, feeble legs, no eyes, papillose antennæ and shallowly impressed vertex. The body is slender and cylindrical, not at all depressed as it is in *cava*, with an even covering of fine erect hairs.

The movements in life were very slow. Considering the pronotal structure and the larval characters *sharpi* should not be included in Xenodusa sens. strict., but more properly belongs to a distinct subgenus for which I propose the name *Pseudolomechusa*.

Apteronina wasmanni sp. nov.

Length 3 mm. Head broader than long, rounded at sides, occipital margin straight; clypeus projecting, the anterior border rounded; front broadly depressed, the surface concave, with a longitudinal impression extending to occiput. Eyes rather large, located at sides of the anterior third of head. Antennæ long, the first joint about twice the length of the second, which is two-thirds as long as the third; the second joint is sharply constricted near base; fourth joint about half as long as third; joints 4–10 subequal in length, becoming thicker anteriorly; apical joint cylindrical, nearly twice the length of penultimate. Thorax not as broad as head, very slightly longer than broad, rounded in front and at anterior third of sides, posterior to which the sides are straight; posterior border straight; surface slightly concave, with a narrow longitudinal impression at middle. Elytra transverse, each as long as broad, together broader than thorax; sides nearly straight; posterior border rounded. Abdomen at base as broad as elytra, broadest behind. Legs long and slender.

Body and legs subopaque, finely punctate, the punctures coarser on the elytra and abdomen; everywhere with fine, recumbant, silky hairs; thorax and sides of abdomen with longer coarse hairs.

Color black, the antennæ and legs brownish.

Described from several specimens taken with *Liometopum apiculatum* Mayr at Pachuca and Guerrero Mill.

A. schmitti Wasmann, which lives in company with the same host ant from Colorado to Southern Arizona, has the head longer than broad, the thorax is longer in proportion to the width, the general form is more slender; the color is light ferruginous, except the gaster, which is dark fuscous. The color of the Mexican form of the host ant is considerably darker than that of the Arizona variety with which I have taken *schmitti*, so the beetle in each

case resembles the ant in that respect. Besides color the beetle is similar to the host in pilosity and, superficially, in form, and in life it carries its abdomen erect in a manner similar to the way in which the ant holds its gaster. Nothing is known regarding the biological relation of the beetle to the ant.

Dinardella mexicana sp. nov.

Length 2.75 mm. Head slightly broader than long, rounded at sides and in front, posterior border straight; front with a flattened disc. Eyes medium in size, flat. Antennæ short, extending to apex of elytra; joints in front of the middle thickest; first joint as long as the two succeeding together; joints 2–3 longer than broad; joints 4–10 transverse; apical joint a little less than twice the length of penultimate. Prothorax as long as broad, broadest at posterior fourth, posterior to which the sides are straight; anterior and posterior borders straight; disc with a faint longitudinal impression. Elytra transverse at base, together considerably broader than thorax; sides slightly rounded; the posterior border of each straight. Abdomen broad and flat; at base as broad as elytra, the greatest width at the third and fourth segments. Legs short and slender.

Body subshining, finely punctate throughout and covered with a fine mat of yellow pubescence; the thorax and elytra bear scattered, erect, black hairs.

Color dark fuscous to piceous, legs and antennæ lighter.

Described from a small series taken at Pachuca and Guerrero Mill with *Liometopum apiculatum* Mayr.

Besides being much darker in color *D. mexicana* differs from *D. liometopi* Wasmann in the shape of the head, which in the latter species is distinctly triangular and much broader than long; in the thorax not being broader than long, and in having proportionately longer elytra.

Zyras (*Myrmœcia*) **tapinomatis** sp. nov.

Length 3 mm. Thorax broad; abdomen narrow. Color piceous, except the antennæ, mandibles, palpi and tarsi, which are fuscous; shining throughout; the antennæ less so than the body. Head not as wide as prothorax, about as long as broad; finely but distinctly punctate. Antennæ not extending to apex of elytra, thick; first and third joints longer than broad, second joint small; joints 4–10 as long as broad, each slightly longer than the preceding; apical joint a little shorter than the next two together. Pronotum a little broader than long, with rounded sides, the disc at middle very broadly and deeply impressed, the impression about one and a half times as long as broad; finely punctate. Elytra together broader than long, the sides straight and parallel, punctured similar to pronotum. Abdomen long and slender; about two-thirds as broad as elytra; very shining; the third and fourth segments each having on the dorsum a prominent tubercle, the anterior of which is the smallest, conical, and bears at the sides a fine mat of re-

cumbent yellow hairs; the posterior from above is round, with flat surface and without hairs. The median portion of the abdominal dorsum is glabrous; the rest of the body, legs and antennæ are thickly though microscopically pilose, the antennæ more densely than the other parts.

Described from three specimens taken at San Miguel in nests of *Tapinoma sessile* Say.

This species is very similar to *M. lugubris* Casey which I took some years ago in Orcus Island (Puget Sound) with colonies of the same host ant, but differs in the fine punctation of the head and thorax, which in *lugubris* are reticulate. The thoracic depression in *tapinomatis* is deeper and narrower than in *lugubris* and the abdomen is proportionally much more slender.

Family Pselaphidæ.

Pilopius major sp. nov.

Female: Length 3.25 mm. Color throughout brown. Head narrower than thorax; from the front twice as long as broad, the sides in front of eyes sub-parallel; vertex foveolately impressed at sides, a thin median carina extending to between the antennal tubercles. Eyes large and convex, located at the posterior third of head. Antennæ thick, the first joint slightly bent at base, as long as the two succeeding joints together; third joint smaller than the fourth, which is larger than the fifth; joints 5–11 sub-globose, equal in size; apical joint one and three-fourths times as long as penultimate, thickened. Prothorax a little longer than broad, narrowed in front, with rounded sides; base compressed above, with median and lateral foveæ; the former is elongate, extending one-third the distance to apex. Elytra together longer than broad, the sides rounded; humeri elevated into thick ridges; discal striæ broad, slightly arcuate, extending three-fourths the length of elytra. Abdomen narrower than elytra and about the same length.

Body shining everywhere, finely punctate, with a thin covering of short, scale-like hairs which are more dense in the pronatal foveæ and on the occiput and posterior elytral margins.

Described from specimens taken at San Miguel with *Prenolepis* (*Nylanderia*) *mexicana* Forel., one from each of three colonies. The maxillary palpi are short and proportionally smaller than in the other species of the genus that I have seen. This species belongs to the group which includes *pulvereus* Lec., *ocularis* Csy. and *abruptus* Csy., in the latter two of which only the males have been described, but is considerably larger than any of these. The pubescence is much sparser than in *pulverius*. The other species whose hosts are known are guests of different species of Aphæno-

gaster. Like most other Pselaphids of myrmecophilous habits, few are found in a single ant colony, but they are generally common, there being one or two in almost every nest of the host ant in the localities where they occur.

Family Histeridæ.

Hetærius helenæ sp. nov.

Length 2 mm. Color reddish-brown, in some specimens the side margins of the head, the margin of mandible and apex of femur piceous; shining. Form robust, about two-thirds as broad as long. Head above sparsely, coarsely punctate, less so between the eyes and beneath; clypeus about twice as broad as long, finely punctate; front with short yellow hairs. Thorax transverse, its breadth nearly twice the length; broadest at base; front border concave, narrowly margined; sides straight to the constriction, which is located about five-eighths the distance from the anterior angle to base; median portion of disc finely, regularly punctate, with sparse yellow hairs; marginal portion in front of constriction very finely rugose longitudinally and less shining than the remainder of thorax; the anterior border feebly rounded, posterior portion slightly elevated; margin of sides with a rather dense brush of long stiff yellow hairs. Elytra at base distinctly broader than thorax, the width of both together about equal to length; abundantly pilose; apical margin punctate; marginal and humeral striæ entire; third and fourth striæ extending for five-sixths the length of elytra, carinated for entire length. Propygidium and pygidium finely rugulose, the former with sparse long hairs. Posternum narrowly margined for half its length; transversely impressed at half the distance from end of margination to anterior border; distinctly excised at anterior border; margined portion shining, smooth behind and finely punctate in front. Anterior tibiæ nearly a third as broad as long, the front margin posterior to the angle straight, with about eleven elongate denticles. Middle and posterior tibiæ one-third as broad as long, the outer edge rounded.

There is considerable variation in the shade of color and a little in size. The hairs are rather long, curved, and moderately abundant. In some specimens they are almost entirely absent, probably having been scraped off by the ants.

Described from a number of specimens taken in nests of *Formica subcyanea* Wheeler and *F. microgyna* subsp. *rasilis* var. *nahua* Wheeler. The former ant is the favorite host, as nearly every nest in some localities contained the beetles, while they were found in only one nest of the latter species out of dozens examined.

This species, the first known from Mexico, is more closely related to some undescribed forms from our southwestern states than to any of the described species. It is more pilose than any of the species which I have seen, except *californicus* and an undescribed species (*hirsutus mss.*) from Arizona.

Terapus mnizechi Mars.

Two specimens were taken at San Miguel in nests of *Pheidole vasleti* var. *acolhua* Wheeler. In the place where these were found was a stone fence extending for about a half mile, along which were literally hundreds of nests of *acolhua*. Although I made several visits here and searched many nests in other localities for the beetles no more were found. It is evidently exceedingly rare locally but has a wide distribution in Mexico.

Terapus infernalis Fall.

Melanetærius infernalis Fall.

An account of this species has been given by Wheeler (PSYCHE XVIII, 1911, p. 112–114) who found a number of specimens at Pasadena in company with *Pheidole hyatti* Emery. One of these was studied by Bickhardt (PSYCHE XIX, p. 97, 1912) who found that the beetle and most of the details of Wheeler's figure agreed with Marseul's description and figure of *mnizechi*, to which species he referred it. Recently, through the kindness of Mr. J. H. Arrow, I was able to examine in the British Museum a specimen of *mnizechi* from the Federal District of Mexico. This was undoubtedly the same as the San Miguel specimens, and these are specifically quite distinct from the Southern California form. In *infernalis* the propygidium is feebly punctate above and more coarsely beneath, with the upper, smoother portion much smaller than the lower, and there is no sharp line between the two parts. In *mnizechi* the upper portion is smooth and shining, the lower punctured and opaque, and each part is in strong contrast to the other. The upper part is proportionally larger than it is in *infernalis*. The latter species is smaller, measuring two millimeters while *mnizechi* measures three.

Family SCARABÆIDÆ.

Cremastocheilus, *subgenus* Myrmecotonus nov.

Type: *Cremastocheilus knochii* Lec.

I propose this subgenus to contain those species which have the mentum angulate behind. This character is correlated with the geographical distribution of the species, all of the species in this group inhabiting the middle and far West. *C. wheeleri* Lec.

should be included with these, though in some specimens the mentum is very feebly notched.

The species which belong to *Cremastocheilus* subgenus *Cremastocheilus* have the mentum distinctly incised behind and are all native of the Atlantic states. The type of the genus *Cremastocheilus* is C. *castaneæ* Knoch.

Cremastocheilus (Myrmecotonus) mexicanus West.

Several specimens, found with *Formica subcyanea* Wheeler at Guerrero Mill agree closely with others identified as this species from nests of *Formica gnava* Buckley in the Huachuca Mts. (Schaeffer) and from the Santa Rita Mts., Arizona (Snow). There is in this series, as in other species in the genus, considerable variation in sculpture and pilosity as well as in size.

Cremastocheilus (Myrmecotonus) armatus Walker.

C. pilisicollis Horn.

Recently I examined the type and several paratypes of *C. armatus* in the British Museum, and compared with specimens of the form which is identified in collections as *pilisicollis* Horn. The two are identical, so the latter name must fall into synonomy, as was considered probable by Horn. (Monographic Revision of the species of Cremastocheilus and Synopsis of the Euphoriæ of the United States. *Proc. Amer. Phil. Soc.* XVIII, 1879, p. 390).

Family Curculionidæ.

Liometophilus manni Fall.

A single specimen of this curious weevil was taken at Pachuca in the galleries of a colony of *Liometopum apiculatum* Mayr. The species was first found in Southern Arizona, where it lives with a variety of the same ant. The oily-red color, so characteristic of the chitin in many beetles of myrmecophilous habits, is evident at the middle of the anterior elytral margin, where the scales are absent, probably having been gnawed off by the ants. This is, so far as is known, the only truly myrmecophilous weevil found in North America.

The Mexican specimen (length 4 mm.) is considerably larger than a paratype from Arizona in my collection, and the light-

colored transverse bands on the elytra are in stronger contrast to the rest of the body, but otherwise the two agree closely.

HYMENOPTERA.

Family Diapridæ.

Hemilexis jessei sp. nov.

Female: (Fig. 3). Length 3 mm. Color jet black, except the mandibles, front of the propleuræ, petiole, antennæ and legs, which are rufous. Head subglobose, as broad as long and about as thick as long, sparsely punctulate, with scattered white pilosity; occipital border rounded, sides in front of eyes very slightly concave. Mandibles thick and short; bifid at tip. Eyes large, orbicular, little convex, black, located at sides of head posterior to middle. Ocelli small, arranged in a triangle. Antennæ inserted at bases of flattened tubercles; contiguous at base; the scape clavate, about as long as head; apex of scape shortly excavated beneath, unarmed. Pedicel thickened toward apex, as long as the first funicular joint; first funicular joint a little longer than the second, joints 2–6 subequal; the last four subequal, forming a club. Prothorax above very short; in profile triangular; the pronotum thickly covered with white pubescence. Parapsidal furrows shallow, but distinct, extending the length of mesonotum. Mesonotum feebly, very sparsely punctate. Scutellum sparsely rugulose longitudinally, transversely

Fig. 3. *Hemilexis jessei* sp. nov. ♀

depressed posteriorly. Metanotum longitudinally carinate at middle, the surface rugulose. Petiole cylindrical, twice as long as broad, smooth and shining. Abdomen smooth and very shining; somewhat depressed. Legs rather short, the femora narrow basally, and clavate at apex. Wings extending past tip of abdomen, the tips rounded; pilose; slightly infuscated; veins yellowish.

Described from a series found in several colonies of *Formica subcyanea* Wheeler about Velasco and near Guerrero Mill. This is the second American species of Hemilexis as defined by Kieffer (*Gen. Ins. Fasc.* 124, p. 20, 1911), and differs widely from the other, *H. californica* Ashmead. Nothing is known regarding the habits of the other species, but *jessei* and the following variety are undoubtedly closely associated with the ants, probably as parasites on the immature phases. Only one or two individuals were found in each nest. They moved about rather slowly among the ants, which paid no attention to them.

This species is dedicated to my small collecting companion, Master Jesse Van Law.

Hemilexis jessei var. minor var. nov.

Three females which were taken in the same locality and with the same host ant as the preceding form seem to belong to a distinct variety. The size is much smaller (length 1.75 mm.) than in the typical form, and the coloration is lighter. The prothoracic pleuræ, scutellum and petiole being light fuscus. Otherwise the two forms are identical.

Family Bethylidæ.

Bruesiella gen. nov.

Female. Apterous. Head transverse, broader than thorax; face evenly rounded, smooth except small foveæ at apex. Antennæ 12-jointed, the basal joint much enlarged; inserted at base of clypeus; narrowly separated at base. Mandibles stout, thickened at tips. Eyes well developed, oval, flat. Ocelli absent. Prothorax transverse, smooth, with a single large puncture near a feeble longitudinal impression at margin. Mesothorax transverse, the pleuræ extended into a thick, nearly perpendicular lamina. Metanotum from above subquadrate, broadest behind, sides feebly, irregularly margined; the posterior border with an acute, interrupted carina. Scutellum absent. Abdomen slender, somewhat depressed. Legs short, stout, the middle and posterior femora swollen, flattened; tibiæ spinose, the middle more strongly than the others.

This genus runs out at Sclerochroa in Kieffer's table in the Genera Insectorum. (Fascicle 76, p. 10, 1908). The peculiar structure of the mesothorax is quite different from that in any other of the described allied genera. In general appearance it bears considerable resemblance to some of the Thynnidæ.

Type: Bruesiella formicaria sp. nov.

Bruesiella formicaria sp. nov.

Female: (Fig. 4). Length 3.5 mm. Body shining. Head, thorax, anterior portion of first abdominal segment and legs brown, remainder of abdomen black.

Head much broader than long, with straight sides, rounded posterior corners and straight posterior border. Clypeus broadly rounded in front. Mandibles slender, curved; the tip thick. Eyes large and flat, located in front near sides at about half their length from base of clypeus. Ocelli absent. Antennæ 12-jointed, short and thick, the first joint swollen, as long as the second and third together; second joint shorter than third, joints 3–11 subequal, cylindrical, longer than broad; apical joint about twice as long as penultinate. Head and antennæ shining, minutely punctate, the vertex with four distinct foveæ arranged trapezoidally. Prothorax transverse, narrowed in front to form a short, thick neck, sides slightlyrounded; posterior border concave. Mesothorax transverse, flat above; the pleuræ extended into broad, vertical lamellæ, which incline slightly backward toward the base. Metanotum narrower than mesonotum, longer than broad, widest behind; depressed at middle, the posterior border acutely carinate; posterior surface flat. Abdomen with a short thick petiole; a little longer than head and thorax, subcylindrical. Legs stout, the femora enlarged, flattened, middle tibiæ with five strong spines on outer edge. The entire body with very sparse scattered erect, black hairs, tarsal joints spinose at apex.

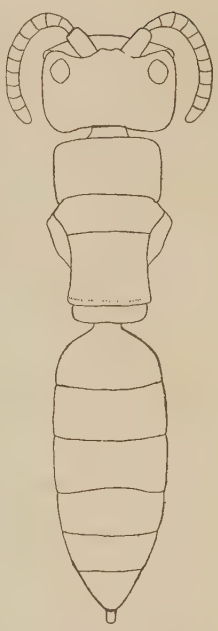

Fig. 4.
Bruesiella formicaria gen. & sp. nov. ♀

Described from a single specimen taken with *Formica microgyna rasilis* var. *nahua* Wheeler at Guerrero Mill.

Family Pteromalidæ.

Pheidoloxenus wheeleri Ashmead.

A single specimen of this wingless parasite was found with *Pheidole ceres* Wheeler var. *tepaneca* Wheeler at Guerrero Mill. Wheeler, who discovered the species in nests of *Pheidole instabilis* in Texas, considered that it is entoparasitic, either on the ants or their brood.

Family Eucharidæ.

Orasema tolteca sp. nov.

Female: Length 4 mm. Head triangular, slightly longer than broad, with convex occipital border and nearly straight sides. Mandibles bidentate, the teeth long and acuminate; front flat; clypeus and frontal area separated from the remainder of front by a deep impression. Eyes oval, large, very convex; ocelli large and

convex, arranged in a broad triangle. Antennæ short and stout, the funiculus extending barely to occipital border; pedicel slightly longer than thick; funicular joints subequal, cylindrical, one and one-third times as long as broad; apical joint conical, one and one-half times the length of penultimate. Thorax trilobed, lobes convex. Scutellum rounded behind, with a strong transverse impression before the posterior border. Metanotum abruptly sloping, with strong lateral sulci. Petiole from side more than twice as long as thick.

Head shining, finely densely punctuate, the temples finely shagreened; flagellum coarsely punctate and opaque. Thorax and petiole coarsely, densely, rugosely punctate; parapsides finely, transversely aciculate; gaster smooth and shining. Scape brown at base, flagellum black, tips of femora, the tibiæ and tarsi ferruginous; rest of body metallic green. Wings slightly infuscated, veins and the distinct stigma brown.

Male: Similar to the female. The thorax is bronze in color, and the petiole proportionally thicker.

One male and two females, together with numerous pupæ were found at San Miguel in nests of *Pheidole vasleti* var. *acohlma*. The pupæ were lying among the brood of the ants, and were always quickly removed by the worker ants when the nest was uncovered.

This species is much larger than *O. occidentalis* Ashmead, from Southern California, but is otherwise very similar. *O. stramineipes* Cameron, from Panama differs in the form of the metanotum which has: "a central area bordered by keels which sharply converge at the top." This is entirely different to the structure of the metanotum in *tolteca*.

THE BACTERIAL DISEASES OF CATERPILLARS.[1]

By R. W. Glaser.

There seems to be a considerable amount of collateral evidence that caterpillars are subject to bacterial diseases, but I am not familiar with a single case where this has been conclusively proved. Such a state of affairs can be explained in part by the fact that much of the work on caterpillar diseases was done before the introduction of Koch's technical methods in 1880 or shortly after, before these methods had been fully perfected. Within compara-

[1] Contribution from the Bureau of Entomology in coöperation with the Bussey Institution of Harvard University. (Bussey Institution, No. 83.)

tively recent times diseases occurring in the same caterpillar, but totally different etiologically were confused with one another. The same name was often given to two distinct diseases and *vice versa*, the same disease was designated differently by different workers. Furthermore, the cultural and biological characters of the bacteria isolated were never thoroughly studied and hence no two investigators knew whether they were dealing with the same or different species. Many people untrained in bacteriology entered this field and helped to swell the enormous literature already accumulated with their inexact observations and careless experiments. Everyone familiar with the subject knows how difficult it is, how careful one has to be in drawing conclusions and how easily serious mistakes are made. From a consideration of some of the more important contributions to our knowledge of the bacterial diseases of caterpillars, the present condition of the subject will become apparent as well as the vast number of problems yet unsolved.

Flacherie and the Clinical Picture of an Infected Silkworm.

The diseases known as "flaccidezza," "lethargia," "negrons," "mortipans," "maladie de tripes," "maladie de morts-blancs," "maladie des morts-flats," "schlaff-sucht," "faulsucht," "flaccidity," "schizomycosis," and "caterpillar cholera" are synonymous with the one known as flacherie.

Flacherie appeared in the silk industry as an epidemic at the end of the sixteenth century. The larvæ usually contract the disease, which is characterized by its acuteness, after the fourth moult or at the time of spinning. Sick caterpillars show very few outer symptoms except loss of appetite and sluggishness. Sometimes their skin becomes black but in other cases they retain a healthy appearance till death. Soon after death the body becomes soft, flabby and dark colored in twenty-four to forty-eight hours and is filled with a brown-black liquid which is said to contain many bacteria.

The Etiological Factor of Flacherie in Silkworms and Other Caterpillars.

In 1870 Pasteur recognized flacherie in silkworms as a distinct disease capable of transmission to healthy larvæ by the infection of their food, either with the excrement of sick individuals or with

the dust of infected silkworm nurseries of the year before. Pasteur believed that a number of organisms, which multiplied in the intestine, were responsible for the disease. In 1873 Bolle found that bacteria were very plentiful in the bodies of silkworms affected with flacherie. In 1886, S. A. Forbes found that the alimentary canal of silkworms during the first stages of the disease was full of micrococci. He also obtained these micrococci from the blood in pure culture and believed them to be identical with *Steptococcus bombycis* described by Cohn. Forbes says that the disease can be transmitted by means of this bacterium and larvæ so infected die after twenty-four to forty-eight hours. He further states that the disease is not transmitted through the egg and that the bacteria retain their vitality for years.

In 1891 Macchiali found two organisms responsible for flacherie, namely, *Streptococcus bombycis* and a *Bacillus bombycis*.

In 1893 Wachtl and Kornauth expressed the belief that the bacteria found by Pasteur in 1870 are identical with *Microzyma bombycis* described by Béchamp in 1867 and identical with *Streptococcus bombycis* Cohn. At about the same time Cramer, Cuboni and Garbarini considered *Streptococcus bombycis* to be the causative agent of flacherie.

In general, *Streptococcus bombycis* seemed to be the form most frequently encountered and the controversy practically subsided with the acceptance of this bacterium as the etiological factor of flacherie in silkworms.

In 1903 Kelly made the remarkable statement that "flacherie is but another name for indigestion." Other theories as far-fetched as the above followed in rapid succession, the most extreme, perhaps, being the one advanced by Sawamura in 1906. He says: "The writer has inferred from his experiments that the flacherie of silkworms can be caused by various bacteria of general occurrence. During that disease no specific bacteria can be found which would be restricted to the occurrence in that epidemic. The following bacteria were found by the writer to produce flacherie by multiplying in the body of the silkworm:

1. *Bacillus coli.*
2. *Bacillus Ellenbachi.*
3. *Bacillus ferrugenus.*
4. *Bacillus fuchsinus.*

5. *Bacillus megaterium.*
6. *Bacillus megaterium bombycis.*
7. *Bacillus mycoides.*
8. *Bacillus pyocyaneus.*
9. *Bacillus rubefaciens.*
10. *Bacillus viridans.*
11. Various species of Proteus.
12. *Micrococcus (Staphylococcus) pyoyenes aureus.*

Our knowledge of the etiology of flacherie in silkworms has not advanced in the least since Pasteur's time and the same thing can be said of other caterpillar diseases of a supposedly bacterial nature.

Forbes in 1886 and 1888 described flacherie-like diseases in the caterpillars of *Pieris (Pontia) rapæ*, *Datana ministra*, *Datana augusi*, *Mamestra picta*, *Pyrameis cardui*, and *Nephelodes violans*. In 1888 he said that "all the bacterial diseases of insects thus far carefully studied, take first and principal effect on the epithelial layer of the alimentary canal, no distinctively blood disease having yet been distinguished if we except a supposed flacherie of *Cleonus* larvæ reported by Metschnikoff in Russia, but not critically investigated."

The flacherie-like disease in caterpillars of the meal moth, described by Berliner in 1911, seems to begin with an acute intestinal disturbance which later affects the entire body, converting the interior into a brown liquid. In April, 1913, an article on Septicemia-like disease of caterpillars of *Arctia caja* L. appeared in the "Comptes Rendus des Séances de l'Académie des Sciences."

According to the authors Picard and Blanc, caterpillars dead from this disease become flaccid and give off a putrid odor. Their digestive tube is empty and contains a clear liquid often exempt from micro-organisms. The blood, however, contains a pure culture of what Picard and Blanc call a coccobacillus and with which they have artificially reproduced the disease. This coccobacillus for which they propose the name *Coccobacillus cajæ* measures about 1.5μ and is slightly oval. It is motile, and Gram negative but takes the anilin dyes readily. Cultures in bouillon grow in twelve hours at temperatures ranging from 15 degrees to 35 degrees, with an optimum growth at 25 degrees. The cultures have an odor resembling putrid eggs and in 24 hours assume a greenish fluorescent tint best obtained at the optimum growth temperature. The

cultures do not contain pyocyanin, however, as can be shown by extracting with chloroform. The coccobacillus grows rapidly on gelatine which it liquifies and on gélose (agar) the growth in two cases was slightly fluorescent. Streak cultures on gélose (agar) spread in a short time all over the surface. On potato the growth is feeble and begins to develop only after 48 hours without producing the greenish fluorescent pigment. Caterpillars of *Arctia caja* inoculated in the prolegs with a fine needle dipped in virulent blood or in a culture of bouillon die regularly in three days when kept at 15 degrees and present an intense multiplication of the bacillus in their blood. Inoculated caterpillars die in 12–24 hours when they are kept at a temperature of 25 degrees and the blood of such individuals appears more virulent than the blood of those which die at 15 degrees. If several drops of the culture are introduced into the pharynx by means of a pipette caterpillars die in 24 hours at 25 degrees and the coccobacilli invade the blood. This fact, that caterpillars can be infected by ingesting the etiological factor, leads the authors to hope for the employment of the disease practically.

Picard and Blanc found that brown-tail caterpillars are very susceptible to the coccobacillus. The authors inoculated several Coleoptera and Hemiptera, but found that the bacterium was non-pathogenic to these forms. White rats are also nonsusceptible to the intraperitoneal injection of a cubic centimeter of a virulent culture in bouillon, but the green frog (*Hyla arborea*) is susceptible and dies in 24–48 hours when inoculated in the lymphatic spaces. The blood from such a frog is again virulent for caterpillars.

The above results obtained by Picard and Blanc may have been correctly interpreted, but they can hardly expect bacteriologists to accept them for the following reasons: No account of their actual experiments is given; we know nothing about the number of caterpillars which were used, and no mention was made of controls. The absence of accurate controls alone places the article among worthless publications. Furthermore, the morphological description of their coccobacillus is very superficial and cultural features are almost entirely disregarded. They say nothing about colonies on nutrient gelatine or agar other than a growth was obtained on these media. Many other media absolutely essential

for a scientific treatment of the subject have been omitted. Apart from the pyocyanin test and the mention of temperatures all physical and biochemical characters have been ignored and the question which I would like to ask is: How do Picard and Blanc know that they were dealing with the same organism at all times?

Many of the authors reviewed seem to agree in one point, namely, that the flacherie-like diseases are primarily intestinal affections and that the bacteria concerned are found outside of the intestine, in the body cavity, only during the later stages when the alimentary canal ruptures.

Among certain human diseases somewhat analogous cases can be found. In typhoid fever, for instance, the main lesions of the disease occur in the intestine. Cholera is purely an intestinal affection characterized by diarrhœa in the form of the so-called rice water discharges. Among insects, European foul brood, a disease in bees caused by *Bacillus pluton*, is another example of such an intestinal malady.

While it therefore seems possible that some of the caterpillar diseases now grouped under the name of flacherie are intestinal disturbances caused by toxic products liberated within the alimentary tract by specific bacteria, it is not at all unlikely that other diseases affect other parts of the body such as the disease described by Picard and Blanc. The entire subject, however, is still one for controversy.

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PROTHETELY OR SEMI-PUPAL STAGE IN *LOPHEROS FRATERNUS* RAND.

By H. S. Barber,
Bureau of Entomology, Washington.

In the August number of Psyche (Vol. XXI, pp. 126–129) Williams mentions and illustrates an abnormal larva of *Photuris pennsylvanicus* that had developed the pupal wing pads, assigning Kolbe's term prothetely to the phenomenon, and citing the five previous records of this precocious development. Since photographic records of a parallel case in another genus of Malacoderm beetles are at hand they may be useful in close proximity to the above note to which an omitted case of similar nature may be added. Böving[1] 1906 speaks of an abnormal Donaciid larva:

"In a cocoon a larva with two large pupa wings on one side of the thorax, and a pupal abdomen was found. There was consequently no appendage, but the head and limbs were that of a larva. At the side of this monster, a cast off, entirely normal skin was lying, with the coverings of both cranium and limbs."

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[1] Bidrag til kundskaben om Donaciin-larveneres naturhistorie, Copenhagen, p. 241. Translated into English 1910, Sonderabd. Int. Rev. Hydrobiol. Hydrograph. p. 101.

In September, 1908, Mr. Schwarz and the writer found several scattered larvæ of *Lopheros fraternus* Rand. under a log on the Virginia shore of the Potomac River near Plummer's Island, Md. Some of these were left in place, the rest being taken to the office for breeding where the abnormally warm condition upset their transformation. Several of them developed wing-pads and all died before spring. But an early spring visit to the log disclosed normal pupæ, with their larval skins, where the few larvæ had been left

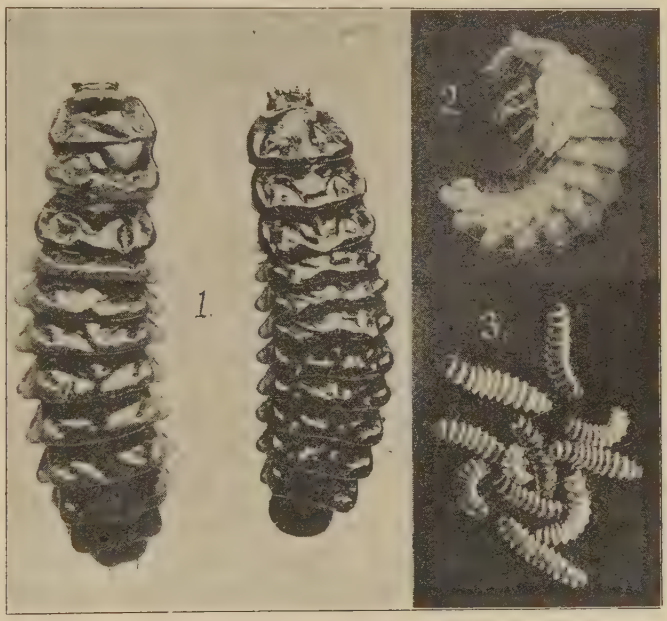

Fig. 1. *Lopherus fraternus* Rand.
1, larvæ x 5; 2, semipupa or prothetelic state x 4; 3, group of larvæ, natural size.

the previous fall and from these adults issued. It was thought at the time that a long period of slow internal change at low temperature was required in preparation for pupation which would be induced by the rise in temperature in the spring, but that the early rise in temperature when the first lot of larvæ were taken to the warm office, had stimulated an attempt at the second operation before the first was completed, causing the abnormal and fatal

development which was then termed a "semi-pupa." It is doubtful if larvæ assuming this state ever successfully develop into adults.

The accompanying illustration shows the dorsal view of the glossy, brown larvæ (enlarged five diameters) a lateral view of the semi-pupa or prothetelic state (four diameters), and a natural size view of the first lot of larvæ.

ASILIDS AND THEIR PREY.

By Stanley W. Bromley,
Southbridge, Mass.

While collecting insects during the summers of 1912–13 at Southbridge, Mass., I was attracted by the predaceous habits of certain Asilidæ and the apparent partiality of some of the species for Hymenoptera, while others, as for example, *Asilus sericeus*, would almost invariably seize a Lepidopterous insect. To ascertain more fully the feeding habits of the species, I made a special collection of Asilidæ with their prey.

Asa Fitch in his Ninth Report, page 251, pl. 4, fig. 7, refers to what is now called Promachus fitchii O. S., as the "Nebraska Bee-killer"—*Trupanea apivora*, stating that he had received it from Nebraska where it was destructive to the honey bee and also to the rose bug. As to robber-flies killing bees, I have not seen them do much damage, but I have never observed them closely in the vicinity of hives. Most of the bees taken were in the field, probably at quite a distance from any apiary. They might, however, become injurious if abundant near a hive, for they always capture their prey on the wing and would undoubtedly seize indiscriminately any bee that came within their range. As the various species of Vespa and other Hymenoptera were more plentiful in the fields than the honey bee, these fell victims to the ravenous appetites of the Asilids which preyed also on members of their own family and, indeed, even on those of the same species.

As far as my observations go, there are very few insects that will attack robber-flies. I have seen a species of *Crabro* sting and

carry off a male *Erax æstuans*, and have also seen hornets kill small Asilids. Spiders are, however, formidable enemies of robber-flies I have taken three *Proctocanthus philadelphicus* from webs of spiders; one from an Epeirid web and two from a web of *Agalena;* six *Deromyia umbrina* from *Argiope riparia, Dasyllis thoracica* from *Theridium tepidarorium*, and many small Asilids and *Erax æstuans* from *Theridium, Epiera* and *Linyphia.*

I am greatly indebted to Mr. C. W. Johnson of the Boston Society of Natural History for many suggestions and kind assistance in naming the insects included in the following lists.

List of Insects and Number of Specimens Taken from Asilids.

Asilus sericeus Say.

(Lepidoptera)

1 *Euvanessa antiopa*
1 *Satyrus alope*
2 *Colias philodice*
2 *Chrysophanus hypophlæus*
1 *Archytas analis*
1 *Eudamus tityrus*
1 *Noctua* sp.

(Diptera)

Asilus lecythus Walker.

(Odonata)

1 *Enallagma* sp?

Asilus orphne Walker.

(Hemiptera)

1 *Typhlocyba* sp?

Asilus notatus Wiedemann.

(Diptera)

2 *Metopia leucocephala*
2 *Sarcophaga* sp?

(Neuroptera)

1 *Chrysopa* sp?

Asilus erythrocnemius Hine.

(Hymenoptera)

1 *Formica* sp? ♀

Asilus latipennis Hine♂.

(Diptera)

1 *Asilus latipennis*♂

Proctacanthus philadelphicus Macquart.

(Hymenoptera)

10 *Apis mellifica*
7 *Bombus vagans*
5 *B. impatiens*
2 *B. perplexus*
1 *B. affinis*
1 *B. bimaculatus*
1 *B.* sp?
1 *Melissodes dentiventris*
1 *Andrena nubicula*
2 *A.* sp?
2 *Halictus nymphacorum*
2 *H. lerouxii*
2 *H.* sp?
1 *Sphecodes* sp?
1 *Crabro sexmaculatus*
1 *Tachysphex* sp?
1 *Sceliphron cementarium*
6 *Formica fusca* and vars? ♀ ♂
1 *Lasius umbratus* ♀
2 *Myrmica rubra* ♀
5 *Pimpla pedalis*
1 *Anomalon* sp?
1 *Pamphilius* sp?
3 *Vespa maculata*
5 *V. arenaria*
2 *V. vulgaris*
25 *V. diabolica*
17 *V. germanica*
9 *V.* sp?
1 *Ancistrocerus capra*
1 *Gorytes simillimus*
4 *Aphilanthops frigidus*
1 *Ceropales fraterna*
1 *Psammochares biguttata*
1 *P. cylindrica*
1 *P.* sp?
4 *Tiphia inornata*
3 *T. transversa*
3 *T.* sp?
1 *Camponotus pennsylvanicus* ♀
1 *Ichneumon trizonatus*
3 *I. creperus*
1 *I. montanus*
1 *I. parvus*
1 *I. lætus*
2 *I. Instabilis*
9 *I.* sp?

(Diptera)

2 *Pachyrhina* sp?
2 *Tabanus microcephalus*
4 *Pangonia rasa*
1 *Chrysops univittatus*
1 *Psilocephala hæmorroidalis*
1 *Asilus notatus*
1 *A. sadytes*
1 *Erax æstuans*
1 *Proctacanthus philadelphicus* ♂
(this was killed by a large ♂)
4 *Deromyia umbrina* ♂ ♀
3 *Deromyia winthemi*
2 *Eristalis tenax*
1 *Chrysotoxum derivatum*
2 *Tachina* sp?
4 *Ptilodexia tibialis*
1 *Othalia cornicina*
2 *Sarcophaga* sp?
1 *Phormia regina*
1 *Muscina stabulans*
1 *Pollenia rudis*
1 *Eurosta comma*

(Lepidoptera)

1 *Chrysophanus hypophlæus*
1 *Pamphila hianna*
1 *Feltia herilis?*
1 *Crambus leachellus*

(Coleoptera)

3 *Cincindela punctulata*
5 *Aphodius fimetarius*
1 *Onthophagus hecate*
1 *Balanius uniformis*

(Hemiptera)

1 *Ceresa biceros*
1 *Jassus olitorius*
1 *Alydus eurinus*
1 *Campylenchnia curvata*
1 *Eurygaster alternata*
1 *Banasa dimidiata*
1 *Euschistus fissilis*
1 *E. tristigmus*
1 *Stictocephala* sp.?

(Orthoptera)

1 *Camnula pelucida*
6 *Orphulella speciosa*
1 *Nemotettix cristattus*

(Odonata)

1 *Enallagma* sp?
1 *Sympetrum rubicundulum*

Erax æstuans Linne.

(Hymenoptera)

1 *Fomica fusca* var?
1 *Ichneumon* sp?

(Diptera)

1 *Atomosia puella*

(Coleoptera)

1 *Melanotus* sp?
1 *Pachybrachys atomarius*
1 *Carpophilus hemipterus*

(Hemiptera)

1 *Carynota muskokensis*

Erax rufibarbis Macquart.

(Hymenoptera)

1 *Halictus nymphæorum*
1 *Ich neumon* sp?
1 *Pimpla pedalis*

(Diptera)

1 *Eristalis tenax*
1 *Sarcophaga* sp?
1 *Muscina* sp?
1 *Stomoxys calcitrans*
1 *Peleteria robusta*

(Lepidoptera)

1 *Crambus* sp?

(Hemiptera)

1 *Tomaspis bicincta*

Promachus bastardi Macquart.

(Hymenoptera)

1 *Halictus ligatus*
2 *H. nymphacorum*
1 *H. lerouxii*
1 *H.* sp?
3 *Vespa diabolica*
1 *Ambyteles rubivagus*
1 *Ichneumon flavizonatus*
1 *I. lætus*
1 *I.* sp.?
2 *Pimpla pedalis*

(Diptera)

1 *Asilus orphne*
1 *A. novæ-scotiæ*
1 *Sarcophaga* sp?

(Coleoptera)

1 *Hoplia equina*
1 *Limonius* sp?

(Hemiptera)

1 *Lygus pratensis*

Promachus fitchii Osten Saken

(Hymenoptera)

2 *Apis mellifica*
1 *Bombus vagans*
2 *Andrena nubicula*
1 *Megachile avara?*
2 *Halictus ligatus*
9 *H. nymphœorum*
2 *H. provancheri*
7 *H.* sp?
1 *Vespa diabolica*
2 *Augochlora* sp?
1 *Ancistrocerus capra*
1 *Aphilanthops frigidus*
2 *Tiphia inornata*
1 *T. transversa*
1 *T.* sp?
8 *Formica fusca* and vars? ♀ ♂
1 *Ichneumon trizonatus*
1 *I. rubivagus*
1 *I. comes*
2 *I.* sp?
2 *Pimpla pedalis*

(Diptera)

1 *Tabanus microcephalus*
1 *Asilus snowii*
2 *A. notatus*
7 *Erax æstuans* ♀ ♂
1 *Promachus fitchii*
1 *Promachus bastardi*
2 *Atomosia puella*
1 *Mesogramma marginatus*
1 *Syrphus* sp?

(Coleoptera)

1 *Cicindela punctulata*
1 *Amara vida*
1 *Haplandrus femoratus*
1 *Elater* sp?
2 *Melanotus* sp?
2 *Hoplia equina*
1 *Macrodactylus subspinosus*
1 *Onthophagus hecate*
7 *Aphodius fimetarius*

(Lepidoptera)

1 *Chrysophanus hypophlæus*
1 *Pamphila peckius*
1 *Pyrausta* sp?

(Hemiptera)

1 *Corizus* sp?
1 *Lygus pratensis*
1 *Emblethis vicarius*
1 *Eurygaster alternatus*
1 *Chlorochroa persimillis*
1 *Euschistus fissilis*

Dasyllis thoracica Fabricius.

(Hymenoptera)

1 *Halictus lerouxii*

(Coleoptera)

1 *Macrodactylus subspinosus*
1 *Glyptoscelis pubescens*

Dasyllis posticata Say.

(Coleoptera)

2 *Aphodius fimetarius*

Dasyllis flavicollis Say.

(Coleoptera)

1 *Telephorus carolinensis*

Cyrtopogon marginalis Loew

(Trichoptera)

1 *Trichopterid*

(Hemiptera)

1 Winged aphid

Deromyia umbrina Loew.

(Hymenoptera)

10 *Apis mellifica*
1 *Bombus impatiens*
2 *B. fervidus*
2 *B. vagans*
1 *Andrena* sp?
1 *Halictus* sp?
1 *Colletes americana*
11 *Vespa diabolica*
2 *V. vulgaris*
2 *V. arenaria*
1 *Gorytes simillimus*
1 *Cerceris deserta*
2 *Crabro interuptus*
1 *Ammophila* sp?
1 *Sceliphron cementarium*
1 *Bembidula ventralis*
1 *Campoplex* sp?
1 *Anthophilus bilunatus*
1 *Taxonus nigrisoma*
1 *Exochilium nigrovarium*
4 *Ichneumon* sp?
2 *I. saucius*
3 *Pimpla pedalis*
1 *Thyreodon morio*

(Diptera)

3 *Pangonia rasa*
1 *Asilus sericeus*
1 *A. novæ-scotiæ*
1 *A. snowii*
1 *Erax æstuans*
1 *Leptogaster badius*
1 *Eristalis tenax*

(Coleoptera)

1 *Trichius affinis*

(Hemiptera)

1 *Ceresa taurina*

Deromyia winthemi Wiedemann.

(Hymenoptera)

1 *Halictus nymphæorum*
1 *Evania appendigaster*
1 *Formica fusca* var?
1 *Augochlora similis*
1 *Campoplex* sp?
1 *Ichneumon w-album*
1 *Anomalon* sp?

Ceraturgus cruciatus Say.

(Hymenoptera)

2 *Formica fusca* ♀
1 *Formica* sp? ♀

(Coleoptera)

4 *Aphodius fimetarius*
1 *Macrodactylus subspinosus*

EXCHANGE COLUMN

Will exchange insects of various orders for Parasitic Hymenoptera from any part of the world.—C. T. Brues, Bussey Institution, Forest Hills, Mass.

Wanted. Ants from all parts of the world.—W. M. Wheeler, Bussey Institution, Forest Hills, Mass.

I pay cash or give American and exotic insects in exchange for fertile eggs of Catocala spp., *living* Catocala ♀ ♀ (captured specimens only), hibernating pupæ and larvæ of any other group of Lepidoptera.—William Reiff, 366 Arborway, Jamaica Plain, Boston, Mass.

Florida insects of all orders, also Fish, Batrachians, Reptiles, Shells and Marine Invertebrates sold by A. G. Reynolds, Gulfport, Florida.

New England Orthoptera identified. I wish to examine adult orthoptera of all families from all parts of New England. Material will be identified for the privilege of retaining desired examples, for which good exchanges will be given, subject to approval of owner.—A. P. Morse, Wellesley College, Wellesley, Mass.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; Insect Life; Harris's Insect; many others.—J. E. Hallinen, Cooperton, Okla.

Histeridæ. North American Histeridæ identified or unidentified, desired in exchange for beetles of other families. F. G. Carnochan, Bussey Institution, Forest Hills, Massachusetts.

Hemiptera-Heteroptera. I desire specimens of this group from all regions, especially New England. I will give in exchange species of this and other orders (except Lepidoptera), and will identify New England material. Correspondence desired.—H. M. Parshley, Bussey Institution, Forest Hills, Mass.

Wanted: Psyche, Vol. VIII, No. 265 (May, 1898); No. 267 (July, 1898); No. 268 (August, 1898); Vol. IX, No. 300 (April, 1901). Address, giving price, Librarian, Stanford University, Cal.

Sarcophagidæ from all parts of the world bought or exchanged according to arrangement. North American material determined.—R. R. Parker, Entomological Laboratory, Massachusetts Agricultural College, Amherst, Mass.

Advertisements.

A new edition of the Naturalists' Directory has just been published by S. E. Cassino, Salem, Mass. This directory is invaluable to naturalists since it is the means of bringing together students and collectors in all parts of the world through correspondence. The directory contains an alphabetical list of English speaking professional and amateur Naturalists in all parts of the world, also a list of Scientific Societies and Periodicals. The price of the Directory is $2.50 in Cloth Binding and $2.00 in Paper Binding. Sent postpaid. As only a limited edition has been printed it is advisable for any one wishing a copy to order at once.

PSYCHE.

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